

Otis (J. N.)

*On the Precautionary Management of
Communicable Diseases.*

A LECTURE

DELIVERED BEFORE THE

School for Nurses at Charity Hospital.

BY FESSENDEN N. OTIS, M.D.,

Clinical Professor in the College of Physicians and Surgeons. Visiting Surgeon
to Charity Hospital, New York.



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COMMUNICABLE DISEASES.

The word communicable in this relation is intended to embrace all diseases which are capable of being transferred from one human being to another, either by contagion or by infection. Although these terms are used, in a general way, to express the same meaning, it seems to be desirable, for convenience of classification, to concede to them their original and natural significance, viz., to limit the term CONTAGION to diseases which are communicable only by direct contact with the disease itself, or through materials which have been subjected to such contact, and to apply the term INFECTIOUS to diseases which are capable of communication through the medium of the atmosphere by inhalation.

One of the chief responsibilities in the care of individuals suffering or afflicted with any communicable disease, is in the prevention of its spread to healthy persons. It is in the province of the physician to instruct in this matter when cases are brought to his notice, but it often occurs that contagious disease exists without such marked discomfort as would seem to necessitate professional aid; hence it becomes desirable for all who are entrusted with the personal care of the sick to be able to recognize the early invasion of communicable diseases, and to know how best to neutralize the contagious element, both for their own protection and for that of others more or less exposed. We shall first consider the local contagious diseases—diseases of the skin—as follows:

Scabies—pediculi of various kinds.

Tinea, or Ring-worm—of various kinds.

Porriqo—favus, or scald-head.

Pityriasis—or liver-spot.

These are all dependent upon parasites, scabies and pediculi being animal organisms, and the remainder due to vegetable growths. In general terms, all pimples and itching eruptions should be suspected as capable of being communicated, and the individual suffering be kept from contact with others, and from using in common any articles of dress or the toilet, until the opinion of a physician can be obtained. Scabies, or itch, is due to the presence of an insect which burrows under the epidermis, or scarf skin. It is especially active at night, and, as a consequence, the irritation which it causes is greatly increased at this time, and, besides, it is then more apt to be communicated, either by direct contact with a person affected or through the medium of the bed clothes.

The clothing of the affected person should be kept carefully separated when such disease is known or suspected; that which has been in recent use should be subjected to a baking process, or thoroughly boiled, in order to destroy the insect and its larvæ which may have been entangled in folds of the garments or bedding, or in the texture of the material. This care should be kept up until a proper treatment shall have thoroughly freed the individual from the presence of the insect. It will be in the province of the nurse, also, to recognize the presence of pediculi—vulgarly known as head and body lice—which not unfrequently produce symptoms and appearances similar to those of scabies, and which may be contracted through the medium of public houses and conveyances, and in other ways, even by children and adults of cleanly and refined habits. The treatment of the clothing in such cases should be the same as for scabies, and a lotion of the officinal *tinctura delphini* freely applied will prove an effectual insecticide.

Where they are localized on the body, an ointment of ung. hydrargyri ammoniati, or white precipitate, will be more effectual. Tinea, or ring-worm, is due to a vegetable parasite,

which has its origin from a similar disease in animals. Thus it may be acquired from cats or dogs, and also from cattle, as well as from contact with human beings afflicted with ring-worm. The knowledge of this method of acquiring the disease would have prevented the spread of it through an entire family, including an infant of three weeks, mother, and nurse in attendance, as occurred in a family subsequently under my care, and where the disease was distinctly traced to a pet black and tan terrier suffering with the "mange." The appearance of a circular or crescentic scaling spot of eruption should receive prompt attention. Every precaution should be used to prevent contact with the spot, either on the part of a patient or others, and the notice of a physician at once be attracted to it.

Sycosis, mentagra, or barber's itch, is of the same nature, but is confined to the face of adult males. It presents the general appearance of aggravated cold sores. It is related of this disease, acquired by a man from a cow, that the eruption in the beard was a true sycosis, while on the skin adjoining it had all the appearance of the ordinary ring-worm. It is most frequently communicated from one human being to another through the operation of using shaving apparatus in common. It should be borne in mind that contact with such faces, especially by children, is likely to produce ring-worm. There is still another contagious disease communicated from animals, called porrigo, favus, or scald-head. This occurs usually on the heads of children as a light-yellow cup-shaped pustule, and when at all extensive it has a distinct mousey smell, and it is supposed to originate in mice. Authentic instances are related where a mouse has given it to a cat, from the cat transferred to a dog, and thence to a child, etc. A knowledge of the possibility of contagion from such sources will often be sufficient to prevent acquirement of the disease.

The ring-worm commences as a red spot, covered with fine

bran-like scales. As the spot enlarges the color gets fainter in the center, so that it soon comes to look like a ring, inclosing healthy skin, sometimes increasing to a diameter of four or five inches. Often fading out at one or more points, the ring becomes imperfect, presenting, perhaps, the crescentic form, or, growing upon others, produces figures of 8 and other gyrate forms. They are most often seen upon the face, neck, or arms. Of the same nature is a red scaling patch which sometimes appears on the inner upper aspect of the thigh, and frequently as large as one's hand. Again it is found upon the head, especially on children, causing a circumscribed loss of hair. All these forms of *tinea* are caused by the same parasite—a vegetable spore called the *trichophyton*.

The last and least important in the list of parasitic diseases is Pityriasis, or Liver-spot. This is a copper-colored eruption, chiefly of the body—occurs in small spots and patches, covered with fine branny scales. It is not usually the cause of much annoyance, except from its unsightliness. The best preventive of contagion is a free application of 10 per cent. solution of salicylic acid.

We shall next consider contagious diseases of mucous membranes. These are leucorrhœa, simple and specific, ophthalmia, syphilis. Leucorrhœas are inflammations of mucous membranes, vaginal or uterine, dependent upon various causes, and characterized by a purulent or muco-purulent discharge. This may be profuse, and yet unattended with any appreciable degree of irritation. In such cases the presence of a *contagium* is very rare; but where it is characterized by *heat and pain*, whatever its source of origin, it may, and is quite likely to, have acquired a contagious element, and thus have the power to communicate a similar grade of inflammation to any healthy mucous membrane with which it may be brought into contact. By the term *simple* contagious leucorrhœa is to be understood an ordinary idiopathic, or self-generated leucorrhœa, which by various influences has been

so intensified that it has acquired the contagious property. The term *specific* leucorrhœa is applied to those acquired by contagion.

The varied character which the simple leucorrhœa may acquire, is best appreciated by the observation of causes of the infantile leucorrhœa which is seen in young girls, and even in infants, and originating from an irritation in the contiguous structures of the rectum, from the pressure of ascarides, or pin-worms. The discharge becomes profuse, and of a greenish yellow hue, indications of a high grade of inflammation. The irritation caused by its passage over the external parts is often such as to excoriate the mucous membrane. The application of it by means of sponges, towels, etc., to the parts of other and healthy children, will at once set up a similar inflammation, and a drop, even an infinitesimal molecule, of the discharge being conveyed to the conjunctiva, the mucous membrane of the eye, will set up a purulent ophthalmia, which may go on, if not properly arrested, to the entire destruction of sight within three or four days. It will then at once be seen that the utmost care is necessary in the management of such, and of all cases of inflammatory diseases of mucous membranes. The care of children afflicted with leucorrhœa is one of the greatest responsibility. In cleansing the parts, the use of sponges should be avoided, and pledgets of cotton (which has previously been boiled, to free it from greasy particles, and make it more readily absorptive) should be used. This should be wound around little wooden sticks (a match will answer very well), and after use be at once cast into the fire. Soft cotton or linen rags may be used the same way, but no articles which have been used in washing or wiping the diseased mucous surfaces should be used a second time. In all cases, previous to bringing *any* material in contact with the inflamed parts, they should be gently irrigated with warm or tepid water by means of a syringe. In the cleansing of

clothes stained by the discharge, the danger of handling them should be borne in mind. They should be carefully separated from those of other members of the family and soaked in water, to which a small quantity of crude carbolic acid (say three drachms to the gallon of water) has been previously added. They may then be cleansed and boiled in the usual way. The care of children afflicted with purulent discharges of the mucous membrane of the eye should be equally exacting; as this latter affection is more especially in the province of Dr. Pooley, who is to instruct you in the manner of nursing, in diseases of the eye, I will not go more fully into the mode of caring for such cases. I now come to the consideration of the most important of the contagious diseases of mucous membranes—Syphilitic disease. This is different in its nature from any yet spoken of. All the other diseases mentioned are of purely local origin: this is a constitutional disease, one of the local manifestations of which, is found in mucous membranes. It originates in a local lesion, the result of inoculation of the *contagium* of syphilis. This is believed to be a human germinal cell, which has, in some mysterious way, acquired the power of gaining access to the human organism, and by rapid proliferation or increase in the system, and by a highly contagious property with which it is invested, to vitiate the blood of the individual affected, imparting to it all the contagious and vicious properties of the original cell from which it was derived. During the active stage of this disease, which lasts for many months, all its products are highly contagious. One of these is a peculiar superficial erosion, or ulceration, of the mucous membrane of the mouth. It may occupy an extensive surface, and it may not be larger than a pin's head, and yet when it is present it is capable of furnishing a *contagium* or contagious principle which, if brought in contact with an abrasion in a healthy person, will set up a disease of the same kind in the person so inoculated. It is not necessary that the lesion in

the mouth shall come in contact with the abrasion; the diseased germ may be transferred from the diseased to the healthy through the medium of a spoon or a pen-handle, or even (as has been known and recorded) of a stick of candy. It is, then, necessary to use the greatest circumspection in the care of persons known or suspected to suffering from syphilitic disease. In a special manner in the care of children affected with syphilis, hereditary or acquired, is care to be exercised with regard to this form of lesion. It has, in numerous recorded instances, been communicated by a kiss and by toys which were used by children in common.

All open sores or abrasions, especially about the mucous orifices of the body, in the persons of the syphilitic, may be reckoned capable of furnishing a contagious principle, and hence the same rules in regard to cleansing and dressing which were given in the matter of specific leucorrhœa holds equally in the case of syphilitic disease. A circumspection in regard to the different modes by which syphilis may be communicated should be exercised, which should be vigilant and constant, and continue during the entire active stages of the disease.

Prominent among the diseases resulting from a local contagion is Pyæmia, or pus absorption; the result of a pernicious influence upon open wounds or abraded surfaces, induced either by some unhealthy condition arising in the person of the sufferer, or by contact of wounds and suppurating surfaces, or an atmosphere impregnated with the emanations from pyæmic patients, or by contact with sponges, dressings, etc., or the fingers of attendants, professional and lay, that may have been in contact with the pyæmic *contagium*. It may also be set up from the influence of erysipelas, the *contagium* of which is known to be capable of inducing pyæmia. In addition, then, to the care which you will exercise (in view of the grave character of the pyæmic accident) in insisting upon the most rigid application of rules laid

down in regard to dressings, utensils, etc., in other contagious diseases, the *hands* should be submitted to a thorough disinfection by washing in water, to which the tincture of iodine has been added, sufficient to color it deeply, say a teaspoonful to a quart of water,* or a forty-grain solution of carbolic acid. The salicylic acid is lauded for its property of destroying living organisms, and also the products of decomposition. The ten-grain solution, which has the advantage of being free from odor, is powerful to remove all smells arising from decompositions which are not associated with sulphureted hydrogen. Least of all should it be forgotten that the influence of an erysipelas may determine an attack of pyæmia; and, if possible, all attendance upon patients with open wounds by one attending upon a case of erysipelas should be prohibited entirely. At least no contact should take place, except after the most scrupulous disinfection.

We have also another grave malady of local origin, viz., Septicæmia, or blood poisoning. This, in cases of wounds and open suppurating surfaces, is considered due to the absorption of putrid or decomposing animal matter, blood clots tissue shreds, etc., from other wounds, or any decomposing animal material. It is the result of direct contact of such matter to the wound or other open lesion, or through particles of the contagion which are in the air. The septicæmic action once set up, from whatever source, a new focus of contagion is established, requiring as complete isolation of the patient as possible, and the disinfectants before spoken of in pyæmic trouble should be brought into play. Both of these diseases are liable to attack recently confined women, either from some local predisposition or condition, or from a contagion brought by the persons in attendance from cases similarly affected.

The fact that both septicæmia and pyæmia may be communicated to a recently confined woman by a person who has

* London Lancet, June 12, 1875, page 829.

been in contact with similar diseases, and also by contact with erysipelas or other unhealthy inflammations, should be fully appreciated by all in charge of puerperal cases, and especially by the professional nurse.

¶ In this connection, also, it will be in order to speak of Puerperal Fever, which by some is a generic term, used to express all inflammatory accidents occurring after child-birth, but which by others is esteemed a distinct disease, both infectious and contagious, of a most deadly nature, and hence is capable of being transmitted through fomites or infected materials, such as the clothes of persons who have been in attendance on puerperal-fever cases. Dr. Fordyce Barker, who maintains the individuality of puerperal fever and its infectious as well as its contagious character, cites an instance from Dr. Holmes:* "A midwife delivered a woman in December, 1830, who died soon after with Puerperal Fever. In one month from this date the same woman delivered thirty women, residing in different parts of an extensive suburb, of which number sixteen caught the disease, and all died. The other midwives, connected with the same charitable institution as the woman already mentioned, are twenty-five in number, and deliver on an average ninety a week, or about three hundred and sixty per month. None of these women had any puerperal fever. Yet all this time this woman was crossing the other midwives in every direction—in the very same quarters where her cases of fever were happening."

In view, then, of the deadly nature of the diseases known as pyæmia, septiæmia, and puerperal fever, and the possibility of their communication from the diseased to the healthy by the hand, or through the presence of the nurse, the terrible responsibility resting upon her, after attendance upon such cases, also including cases of erysipelas, will be appreciated, and every means that is known to science should be eagerly sought and applied. In addition, then, to all the

* Barker on the Puerperal Diseases, page 465.

care and local disinfection previously spoken of, the clothes of the nurse in such cases, even the shoes and the hair and under the finger nails, should be thoroughly disinfected, and the body bathed in a disinfecting solution before contact with other puerperal cases. The clothes, if woollen, should be exposed to a heat of 200 to 250° Fahrenheit, and all washable garments should be soaked in a 40 per cent. solution of carbolic acid, and afterward washed in the usual way. Exposure of the person to an atmosphere in a close room in which a few scales of iodine have been burned is said to disinfect promptly and effectually.* And further, it is a duty to allow as much time to elapse and as much contact with the outside air, before taking charge of new puerperal cases, as is possible, and never less than one or two months in cases of well determined puerperal fever.

Erysipelas may be communicated through the medium of bed-clothes and bedding to healthy persons. The bedding in all cases of contagious and infectious diseases should be of straw, and at once burned after use. It should be changed once a week, at least, during the continuance of the disease.

Diphtheria.—This, when once established, is a contagious disease, and the contagion may collect in a room where persons have been ill with it through lack of proper ventilation and disinfection, so that months after the disease may be communicated thereby to healthy persons occupying the apartment. The disease is confined to mucous membranes, or open wounds or abrasions, and is supposed by recent observers to be the result of an evolution of minute vegetable organisms, producing the local manifestations, and these, reacting in some way upon the mass of the circulation, produce the systemic poisoning. What chiefly concerns us at this time is the known contagious property of diphtheria. It is acquired chiefly, if not solely, by contact with the secretions of the mucous membranes, which are the subject of the dis-

* Dr. Williams in *Lancet*, June 12, 1875, p. 329.

ease. A rigid separation of children or adults affected with it from all not required for their care is essential; and a thorough application of disinfectants to all materials used for applying medication, or in wiping off the diseased spots, must be made. Solutions of chlorine and saturated solution of the salicylic acid (which is shown to possess a special power in destroying animal or vegetable organisms) give promise of being of great service in preventing contagion from this disease. The time required for the development of diphtheria after exposure is laid down by Oertel* as from two to five days, and he instances two cases where the disease was communicated by kissing, in which it appeared in two days subsequent to the exposure.

Typhoid fever, cholera, and dysentery have in common a limited contagious element. Conclusions from the most complete and recent investigations in regard to the origin and mode of propagation of these diseases would warrant the belief that it is through the dejecta or alvine discharges, and in the discharges from the bowels *alone*, that the contagious element is transmitted; and, further, that it is not in the *fresh* discharges that the contagium is present, but that a process of fermentation is necessary to its development, which requires some time. The chief care, then, to prevent the spread of these diseases is to be exercised in thoroughly disinfecting the alvine discharges immediately that they are evacuated, and also to subject to the same process all utensils or materials of bedding and clothing that have been in contact with the excreta. This is most easily and thoroughly done by having constantly standing in the vessels used for the reception of such excreta a sufficient quantity of saturated solution of the sulphate of iron to cover the same, or to sprinkle freely the powdered sulphate over the recent discharge, and to wash the clothes or other materials stained by it with the solution as soon as may be after soiling, and also

* Zeimssen Practice, vol. 1, p. 595.

to use a weak solution of the same in washing the hands of the attendant after each exposure. Beyond this, and attention to free ventilation of the rooms which the patient inhabits, nothing farther will be required to prevent the spread of these diseases.

PART SECOND.

Infectious diseases, or those which may be acquired through the medium of the atmosphere by inhalation. A word in regard to their origin.

There are two classes of causes that have been claimed for infectious diseases. The one is in the nature of a zymotic action or ferment, and therefore due to chemical changes; the other due to the generation of living organisms, thus claiming a vital nature. The vital theory of the infectious principle, the *contagium vivum*, is held at the present day by the majority of recent investigators. Now, in order to present most forcibly the measures necessary to be pursued in combating the influence of the infectious principle, it will be well, it appears to me, to spend a few moments making you intelligent in the matter of the accepted mode of their development and propagation. Investigations conducted through the aid of the microscope have shown that the lowest forms of animal and vegetable organisms are quite similar in appearance and behavior. The living organisms, then, which have been found associated with the contagious secretions and emanations of infectious diseases are not in this way determined to be certainly of animal or vegetable origin; but, while the question in regard to some varieties is still unsettled, the weight of evidence seems to be in favor of the claim made by Lionel S. Beale and others, that they are degraded forms of living matter derived from the human organism. In all cases the disease germ is shown to be a living particle, varying in size from 1-3000 to 100-1000 of an inch in diameter. The white blood corpuscle, which is the integral type of the healthy human germinal matter, is

1-300 of an inch in diameter. It is a jelly-like particle, capable of movement, of transporting itself by stretching out a portion in a given direction, and drawing the residue onward in this manner. It is capable of absorbing non-living material, by surrounding it, incorporating it into its substance, growing thereby. It is capable of multiplication by sending out processes, which, becoming detached by a vital movement, assume at once all the powers and properties of the original granule. The disease germ, it is claimed, is thus propagated in the individual, the subject of an infective disease, until the entire mass of the circulation is vitiated. The property of contagion or infection being conceded to such particles, it becomes important to consider their power of movement, and the means by which they may be transferred from an individual in whom they have been developed to healthy persons. Mr. Beale says of these living particles, "that they may transport themselves from place to place; they may insinuate themselves through the narrowest aperture, or creep through very minute fissures and channels; they may climb through water, *and there is even reason to think they may move upward through perfectly still air*, by virtue of their capacity for vital movement." This inherent power being recognized, and the minute proportion of the disease germ being borne in mind, as well as capacity of infinite and swift multiplication, it is easy to see how diseases dependent upon the induction of a vital *contagium* may be carried into the circulation of a previously healthy or a predisposed organism.

The emanations from the lungs, from the skin, and from the excreta of a person, the subject of a truly infectious disease, become the media through which disease germs are communicated to the air, and, through it, to persons and materials, contiguous as well as in contact, bedding, furniture, floors, walls, ceilings, in some cases clothes, *even through them*, and possibly to distant apartments and places. There are,

fortunately, great differences in the activity and vitality of disease germs of different diseases. With the mild forms of infectious disease are associated disease germs whose influence in disturbing the economy is small, and power of infection is weak and limited. Among these are measles, whooping-cough, mumps, roseola, and varicella, or chicken-pox. These would seem only to require free exposure of the clothes and person to the open air to prevent transference of these diseases to the healthy. In the case of small-pox, the *contagium* is capable of being disseminated, not only from actual contact with the person suffering, but with the clothing and all the materials, bedding, furniture, etc., which have been in relation with such person, but may be wafted through the atmosphere to surrounding houses and places, and be taken into the system of an unprotected person by inhalation. A thorough system of disinfection and ventilation must be insisted on, and an absolute system of quarantine be maintained during the prevalence of this disease. The protection of the nurse in such cases becomes a matter of the first importance, and this may be effected in such cases by *vaccination*. To illustrate the perfect protection which this inestimable boon to humanity is capable of conferring, I will cite a personal experience. Twenty-five years ago, while I was in charge of the small-pox hospitals, which were at that time dependencies of this, the Charity Hospital, it was my habit to subject myself to the simple operation of vaccination every two or three weeks, when fresh matter could be obtained. In conducting a post-mortem examination on a patient recently dead of confluent small-pox, I accidentally thrust a needle through the integumen from beneath, which, passing through a large pustule, entered my right fore-finger (being left-handed), and penetrated to the depth of fully one-third of an inch.

After sucking the wound, no further attention was paid to it until the soreness drew attention to a papule, which grad-

ually increased for a few days, and terminated in a single, well-developed, and characteristic small-pox pustule. This soon declined, and was all the effect, local or general, which resulted from the accident; thus demonstrating the completeness of the protection which the vaccination is capable of affording when the thoroughness of the vaccination is proven. It would, then, be my advice to you always, when called to minister to a case of small-pox, to insist upon a vaccination as the preliminary step, and to neglect no opportunity for re-vaccination during the continuance of your attendance. In case you are already thoroughly protected (and this can never be ascertained, even if you have had varioloid or the natural small-pox, without trial), no harm or inconvenience beyond a trifling pimple no larger than a mosquito bite can occur from vaccination with the pure, humanized or the bovine virus; while, if only partially protected, as by an old attack of the disease, or by a vaccination in childhood, you may receive the disease in its confluent form. If only a varioloid results, and this confined to only a few pustules, even these are capable of transmitting the disease in its worst form to persons not protected.

Scarlatina, or Scarlet Fever, is a highly contagious and infectious disease, which may be acquired through contact with the skin, and through the exfoliations of the skin, which are characteristic of this disease. The contagious element of scarlet fever is one of the most stable and tenacious of all the infectious poisons.

It is believed to reside chiefly, if not wholly, in the epithelial scales, which are cast from the skin, and which, in different degrees of pulverulence, are distributed from the person suffering from, and more particularly during convalescence in, scarlet fever. These may exist as scales, or even exfoliations, so large that they represent the cast of a great portion of the hand, and so small that the fine dust of the exfoliation may float through the atmosphere unperceived by the naked eye,

and yet, in either shape, it may retain its contagious property undiminished for months, even years. Heldebrand, as reported by Watson, was infected by a cloak, which, after exposure to the disease, had been put aside for eighteen months. A strip of flannel has been known to be the medium of contagion after the lapse of a year. (Reynolds.) It will, then, be seen that nothing short of the complete destruction of the exfoliated particles will afford protection against contagion.

1. To avoid contagion is the necessity of establishing a strict quarantine. This must be perfect, or it is quite useless, and a perfect quarantine is almost impossible in private families. Even the passage of an attendant through a hall used in common may result in the distribution of the *contagium*: the fine, invisible particles cling to the hair and dress, and are easily shaken off during locomotion. Fortunately they settle after a time, and become secreted out of the way of contact. The free exposure to the open air soon rids a person of it who has not been long exposed, but one attending upon cases constantly, for a long time, as in the case of nurses, requires thorough disinfection of clothes and person, not forgetting the hair and finger-nails. The furniture of rooms occupied by scarlet fever patients should (as with all contagious and infectious diseases) be as smooth, and scant, and free from hiding crypts as possible, and be subjected to frequent airings during the progress of the disease; and for protection against cold, a second room should be prepared, to which, during airing, the patient should be moved, otherwise ample protection by blankets should be secured. On the subsidence of the exfoliation (which should not be considered as complete while the least amount of branny scurf can be rubbed off) the patient may be dressed in clean clothes, and permitted entrance to the rest of the house. This, in severe cases, will not be under a couple of months. The room should then be fumigated by means of placing a small roll of sulphur in an iron vessel, and setting it on fire, closing the

room tightly, and allowing it to be burned out. All the bedding and clothing should be either burnt, baked, or boiled, and then thoroughly aired. Through this and such thorough expurgation alone can the premises be certainly made safe for the residence of children unprotected from the influence of the disease by a previous attack. The small doses of belladonna recommended for prevention of scarlet fever have, probably, no value.

Relapsing Fever, and Typhus Fever.—These highly contagious forms of fever seem to be transmitted from one person to another by a *contagium* which is so subtle that it has, until recently, eluded the search of the most careful observers. In the case of relapsing fever, or recurring typhus, a minute animal organism has been found in the blood, and constantly associated with its invasion and recurrence, the parasite rapidly disappearing on convalescence. The development and spread of the disease is believed to depend upon these minute disease germs, and to be communicated by contact, or through the medium of an atmosphere more or less impregnated with them. Typhus and typho-bilious fevers are accepted by recent authorities to depend for their origin upon a living disease germ, but the actual demonstration is not yet accomplished; yet in the prevention of infection its presence is assumed, and those means which are found most effectual in causing the destruction of the known minute living disease germs are used to destroy the contagium of typhus and other pernicious fevers.

A few general rules may be laid down, which will be applicable in all cases of infectious fever. Contagious disease germs, it will be remembered, are minute living organisms, and so light that they may be supported by the air, and even carried long distances in a living state. "The breath of the sick person, there is reason to think, in many cases is loaded with contagious germs. There is little doubt that the cutaneous exhalation contains them. It is, therefore, of the ut-

most importance that means should be taken to destroy these particles before they can leave the neighborhood of the sick person or the sick-room. At the same time it is certain that of healthy persons exposed to the influence of these germs, by far the greater majority will escape infection; and observation and experience justify the conclusion that nurses and attendants really run little risk of contracting contagious fevers from the patient, unless they are themselves out of health. A healthy nurse, who takes the ordinary precautions for keeping herself in good health, may be continually exposed to contagion, and devote her life to the service of the sick without being once attacked. But this is no reason for relaxing, in the slightest degree, our efforts to extinguish contagious or infectious poisons, and the greatest precaution should, in all cases, be taken to destroy all contagious disease germs as soon as possible after they come into existence." *

One of the most important measures for this purpose is to secure free and complete ventilation, and a frequent entire change of air in the apartments used by the sick. Contact with the oxygen of the air produces the combustion of the organism to a very great extent, and if sufficient oxygen could be supplied, and brought in contact with the disease germ, it is probable that no other means would be necessary, but the air alone will rarely afford sufficient for this purpose, and from the fact that the germs are often hidden in the folds and texture of garments, and bed furniture. When free access of air is impossible, it becomes necessary to use additional measures.

First, to dispense as far as possible with all hiding places, such as carpets, curtains, and woollens of every description. Second, to secure the most scrupulous cleanliness of the persons of the patient and attendants, and of apartments, and of all clothing and utensils. Permitting access of none but

* Beale, Disease Germs, The Nature and Origin. Second Edition. London, 1872. Page 262.

the necessary attendants, who should be as few as possible, and should communicate as little as possible with other persons.

All the food and drink which has been brought into the sick-room should be consumed by none but the sick, or the attendants, and no clothes should be carried out of the sick-room until they have undergone a thorough disinfection. This may be most readily accomplished by first soaking them in a solution of carbolic acid, $\frac{1}{2}$ ounce to the gallon of water. The *excreta* of the patient should also be at once disinfected, by throwing into the vessel a handful of finely powdered charcoal and bruised sulphate of iron. Where the discharge from the bowels are passed unconsciously, or without control of the patient, a cushion of powdered charcoal may be placed underneath; this will absorb and disinfect at once, freeing from all disagreeable odor. The vapor of tar has a decided power in destroying disease germs. A vessel of water with a little tar poured on it, and set on the grate or over a spirit-lamp, will prove a valuable adjunct in disinfecting persons and apartments. After the occupation of rooms by persons sick with contagious or infectious diseases, a thorough and efficient washing of the floors and ceilings should be insisted on, and the fumes of sulphuric acid gas be set free in them, by burning a few lumps of roll sulphur in an iron vessel, the doors and windows having been previously sealed by pasting paper over the crevices, and letting it remain for twenty-four hours. A more troublesome, but still more efficient mode, is that lately adopted by Professor Doremus, in disinfecting the infected wards of Bellevue Hospital, viz., that of setting free large volumes of chlorine gas. The black oxide of manganese and common salt were mixed to a consistence of thick mud, and placed on vessels made of sheet-lead; the vessels were then filled with the strong sulphuric acid of commerce, and the fumes of the chlorine were then rapidly evolved. The effect of this proceeding was to eradicate thoroughly all

the germs of disease with which the wards had become saturated, as shown by the fact that, in their subsequent occupation, no contagious element was found to remain. In the above proceeding, it is necessary to leave the room promptly, in order to avoid the inhalation of the acid fumes of the chlorine, and also for the same reason to prevent access to the rooms for at least twenty-four hours. Free inhalation of the concentrated fumes of chlorine gas would prove promptly poisonous. With reasonable care, however, this process may be effected without danger, but should only be attempted by those familiar with all the responsibilities of this mode of procedure.

A word now in regard to the *personnel* of nurses entrusted with the care of persons suffering from communicable diseases. All garments worn should, as far as possible, be of *washable* material, and the dress should be made "*gored*," and otherwise as free as possible from tucks and folds. Every pucker is a possible hiding place for disease germs, which thus kept from contact with the air may retain life and be carried until (if not destroyed by baking, or other efficient means) it finds a favorable soil for its development, in persons perhaps miles away. All unnecessary articles of dress should be avoided, remembering that each may become the focus of infection, and no nurse should visit, outside the sick-room, without changing her entire dress, for that which has been in no way exposed to the influence of the infection. The hair in an especial manner should receive the most careful attention, for by itself it is a rare hiding place, and when supplemented, as is a fashion, by *switches*, *rolls*, *mice*, and *chignons*, it is simply a garden spot for the development of diseased organisms. The *finger nails* should also be carefully cleansed.

All adventitious ornamentation should be eschewed, and the natural hair should be thoroughly washed, and, for perfect security, be bathed in a solution of salicylic acid, after an

attendance upon any of the infectious fevers, before mingling with the outside world. Do these conditions seem unnecessarily onerous? You have but to bear in mind the possible results of their neglect. The possible transference of the *puerperal fever* poison to a healthy woman is nearly sure to result in death to that woman. The careless carrying of a scarlet fever disease germ may spread this terrible disease throughout a neighborhood. Never forget that your mission is to succor and save; that human life is entrusted to your care; nor fail to remember that your responsibilities are great, in proportion as the need of your best services is great; and moreover, that these responsibilities do not end with the care of your patient, but are often greatest in relation to the community in which you work and live. Nothing, then, which shall give promise of an added security against becoming the medium of transferring disease from those who have been in your care to others with whom you may come in contact will seem too troublesome or too onerous for you promptly, systematically, and cheerfully to adopt. So will your mission prove one of pure mercy, and your conscience be and remain void of offense towards God and towards man.



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